

## 052NE7N-VB TO262 Datasheet

### N-Channel 80 V (D-S) MOSFET



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω) Max.	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ.)
80	0.0065 at V <sub>GS</sub> = 10 V	85 <sup>a</sup>	17.1 nC
	0.0070 at V <sub>GS</sub> =6.0 V	80 <sup>a</sup>	
	0.010 at V <sub>GS</sub> =4.5 V	60 <sup>a</sup>	

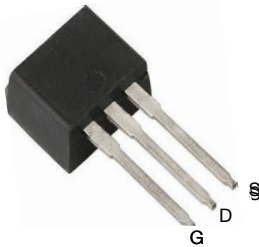
#### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested

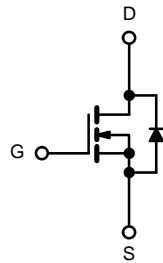
#### APPLICATIONS

- Primary Side Switching
- Synchronous Rectification
- DC/AC Inverters
- LED Backlighting

TO-262



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	80	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	85 <sup>a</sup>
		T <sub>C</sub> = 70 °C	65
		T <sub>A</sub> = 25 °C	28.6 <sup>b, c</sup>
		T <sub>A</sub> = 70 °C	24.9 <sup>b, c</sup>
Pulsed Drain Current (t = 100 μs)	I <sub>DM</sub>	250	A
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	
		T <sub>A</sub> = 25 °C	4.5 <sup>b, c</sup>
Single Pulse Avalanche Current	I <sub>AS</sub>	30	mJ
Single Pulse Avalanche Energy	E <sub>AS</sub>	45	
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	62.5
		T <sub>C</sub> = 70 °C	40
		T <sub>A</sub> = 25 °C	5 <sup>b, c</sup>
		T <sub>A</sub> = 70 °C	3.2 <sup>b, c</sup>
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>		260	

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, f</sup>	R <sub>thJA</sub>	20	25	°C/W
Maximum Junction-to-Case (Drain)	R <sub>thJC</sub>	1.5	2.0	

#### Notes

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- The TO-220 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 70 °C/W.

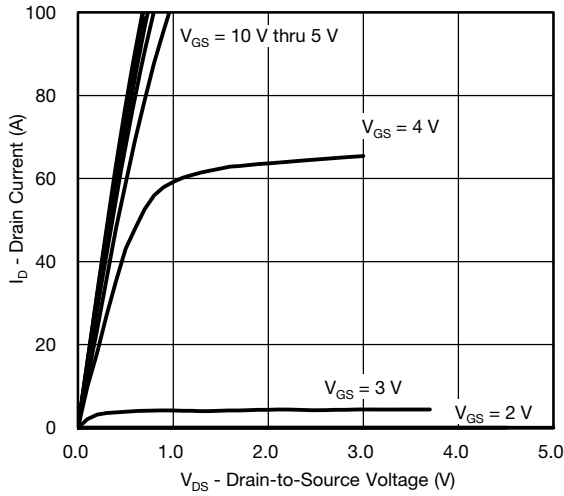
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	80			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		37		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-6.1		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0		4.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.0065		$\Omega$
		$V_{GS} = 6\text{ V}, I_D = 15\text{ A}$		0.0070		
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		0.0100		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 20\text{ A}$		60		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		8000		pF
Output Capacitance	$C_{oss}$			950		
Reverse Transfer Capacitance	$C_{rss}$			276		
Total Gate Charge	$Q_g$	$V_{DS} = 40\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		35.5	54	nC
		$V_{DS} = 40\text{ V}, V_{GS} = 6\text{ V}, I_D = 10\text{ A}$		22	33	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 40\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		17.1	26	
			Gate-Drain Charge	$Q_{gd}$		
Output Charge	$Q_{oss}$					
					$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	
Gate Resistance	$R_g$		$f = 1\text{ MHz}$	0.5	1.3	2
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 40\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		12	24	ns
Rise Time	$t_r$			8	16	
Turn-Off Delay Time	$t_{d(off)}$			32	64	
Fall Time	$t_f$			7	14	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 40\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 6.0\text{ V}, R_g = 1\text{ }\Omega$		14	28	
Rise Time	$t_r$			11	22	
Turn-Off Delay Time	$t_{d(off)}$			30	60	
Fall Time	$t_f$			8	16	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			75	A
Pulse Diode Forward Current ( $t = 100\text{ }\mu\text{s}$ )	$I_{SM}$				150	
Body Diode Voltage	$V_{SD}$	$I_S = 5\text{ A}$		0.76	1.1	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		38	75	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			36	70	nC
Reverse Recovery Fall Time	$t_a$			19		ns
Reverse Recovery Rise Time	$t_b$			19		

**Notes**

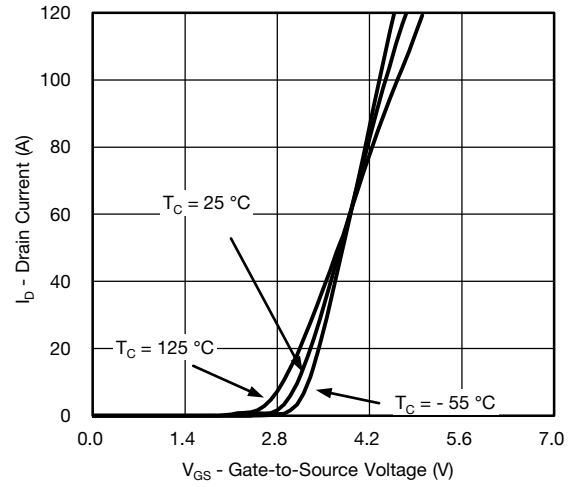
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

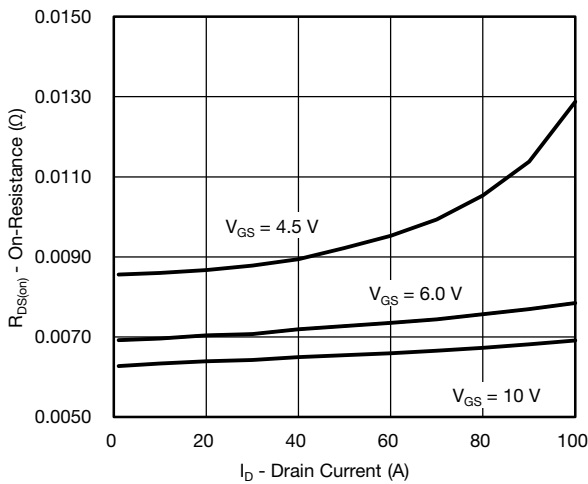
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



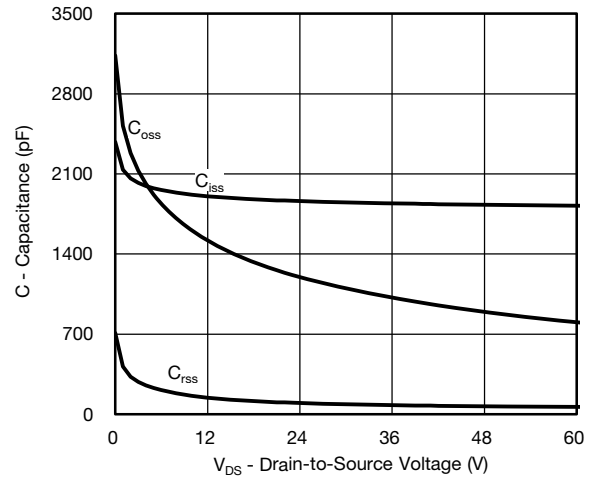
**Output Characteristics**



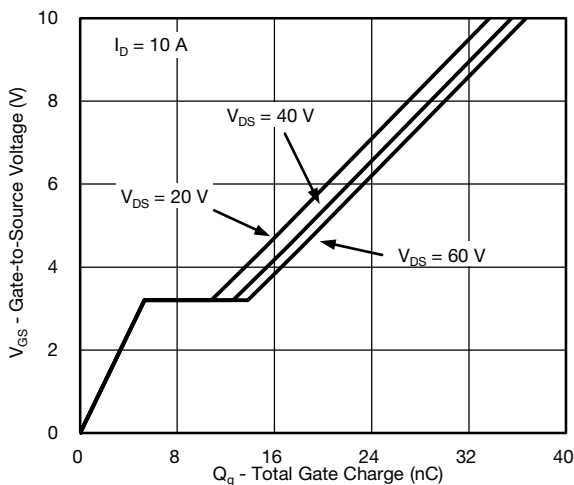
**Transfer Characteristics**



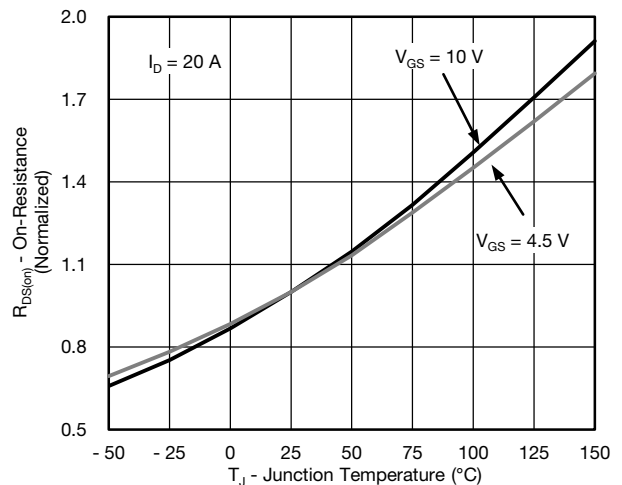
**On-Resistance vs. Drain Current**



**Capacitance**

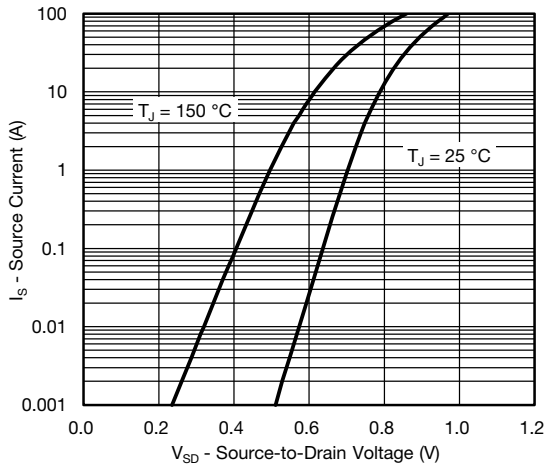


**Gate Charge**

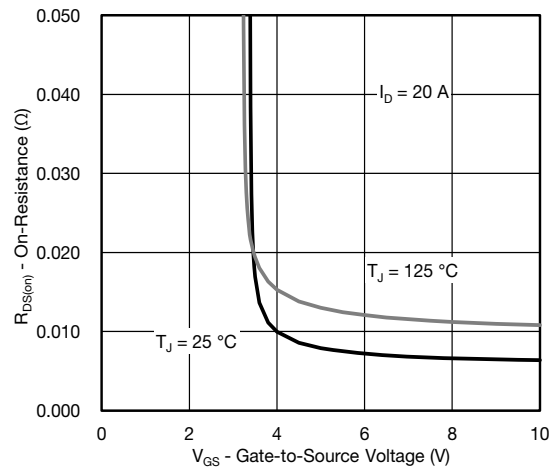


**On-Resistance vs. Junction Temperature**

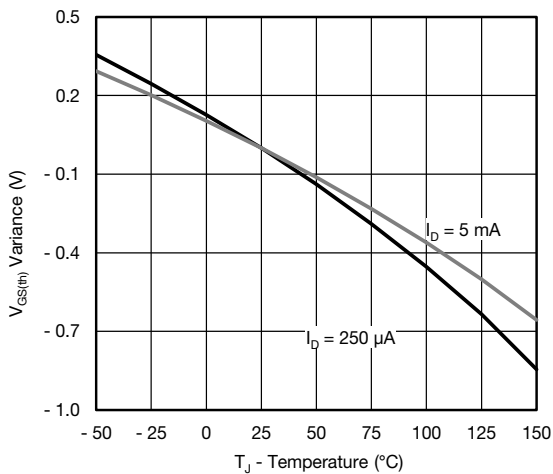
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



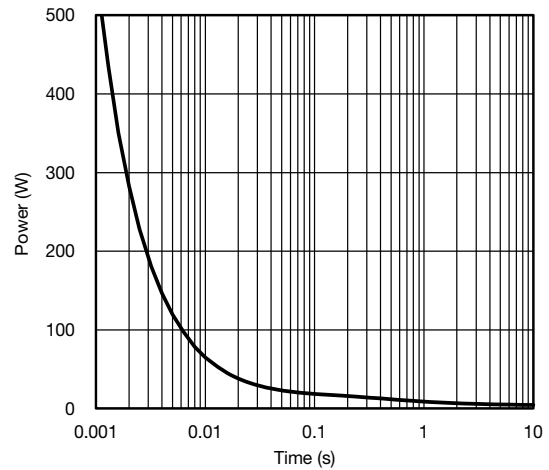
**Source-Drain Diode Forward Voltage**



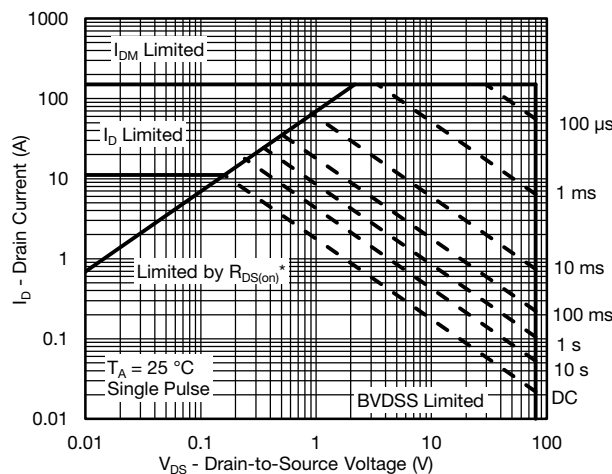
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



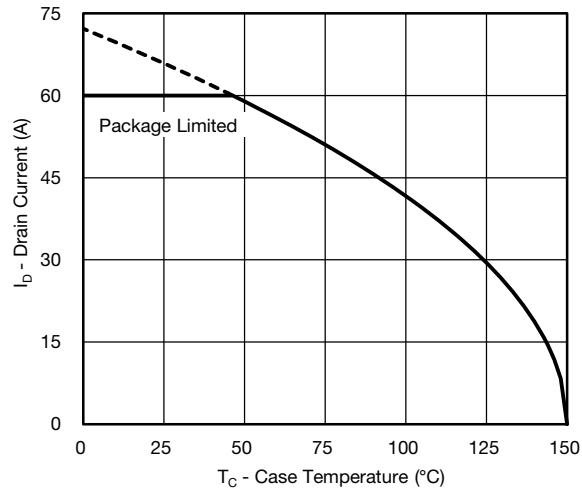
**Single Pulse Power, Junction-to-Ambient**



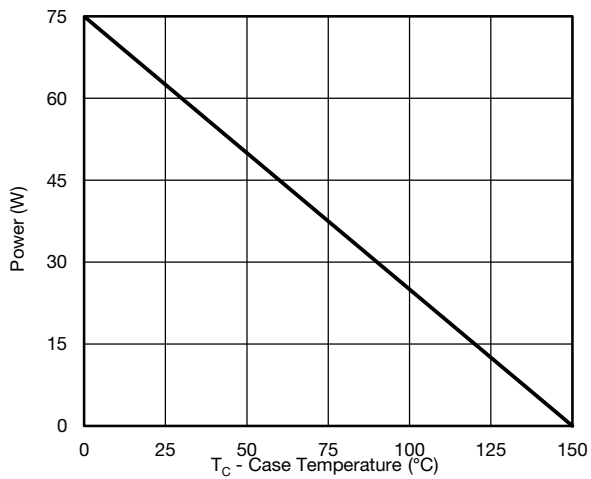
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area, Junction-to-Ambient**

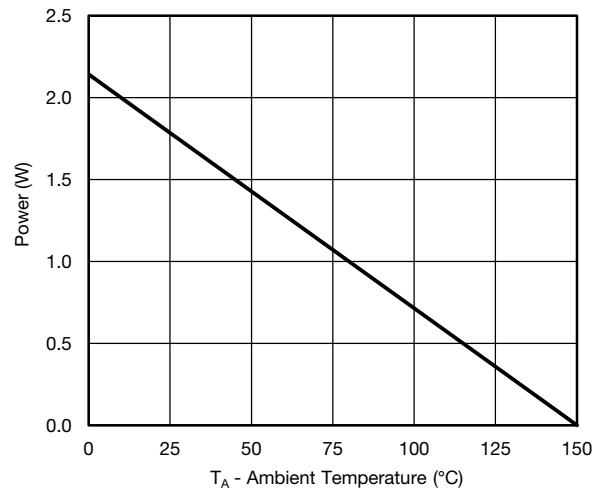
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating\***



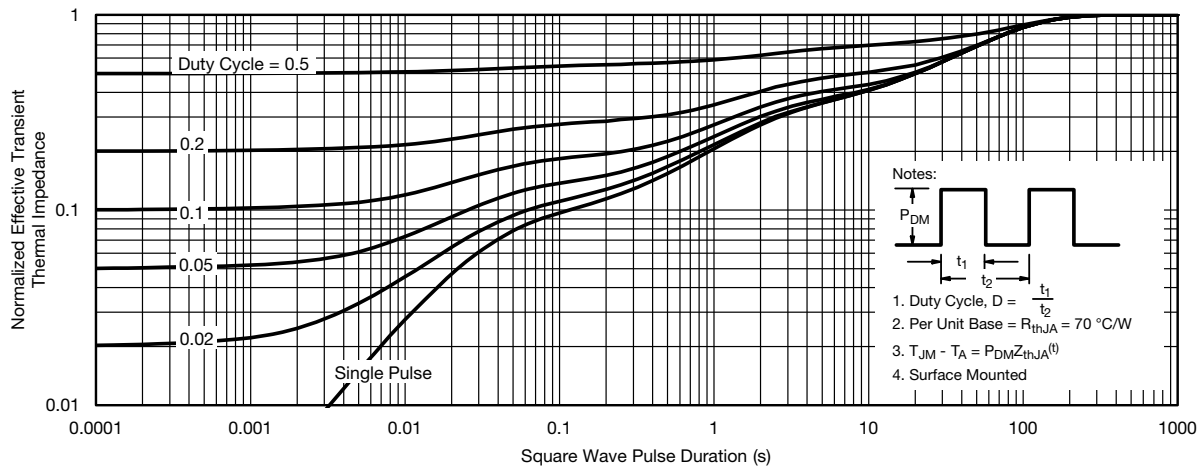
**Power, Junction-to-Case**



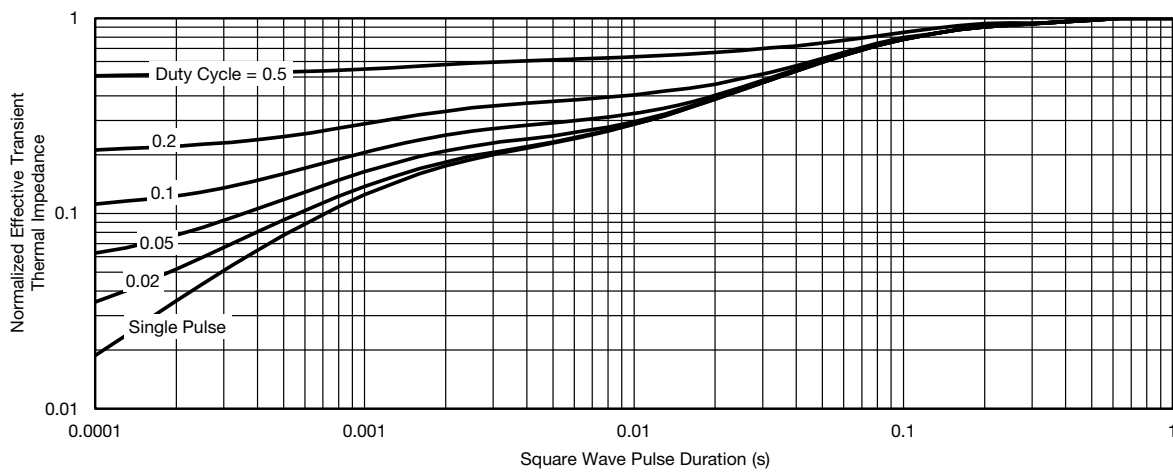
**Power, Junction-to-Ambient**

\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150\text{ }^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

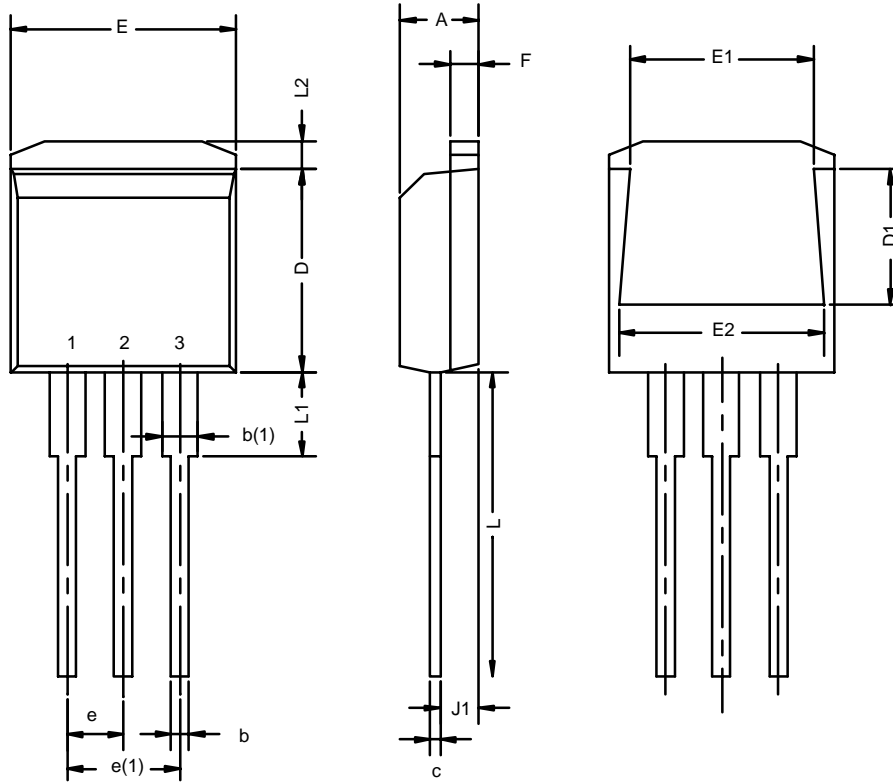


**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

**TO-262: 3-LEAD**



Dim	MILLIMETERS*		INCHES	
	Min	Max	Min	Max
<b>A</b>	4.32	4.70	0.170	0.185
<b>b</b>	0.64	1.00	0.025	0.039
<b>b(1)</b>	1.14	1.40	0.045	0.055
<b>c</b>	0.36	0.50	0.014	0.020
<b>D</b>	8.64	9.65	0.340	0.380
<b>D1</b>	5.59	6.10	0.220	0.240
<b>e</b>	2.41	2.67	0.095	0.105
<b>e(1)</b>	4.95	5.33	0.195	0.210
<b>E</b>	10.03	10.41	0.395	0.410
<b>E1</b>	7.87	8.64	0.310	0.340
<b>E2</b>	9.02	9.53	0.355	0.375
<b>F</b>	1.14	1.40	0.045	0.055
<b>J1</b>	2.41	2.79	0.095	0.110
<b>L</b>	13.08	14.22	0.515	0.560
<b>L1</b>	-	3.81	-	0.150
<b>L2</b>	1.02	1.40	0.040	0.055

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DWG: 5855

\*Use millimeters as the primary measurement

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